

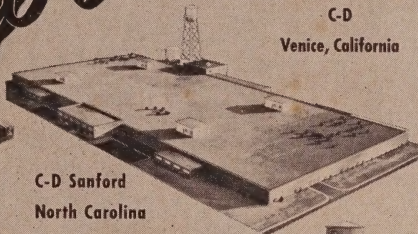
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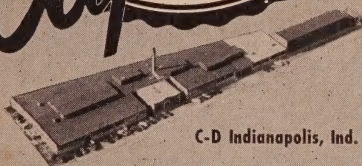
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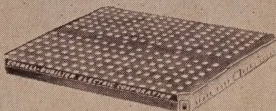
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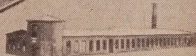
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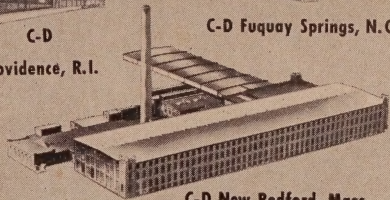
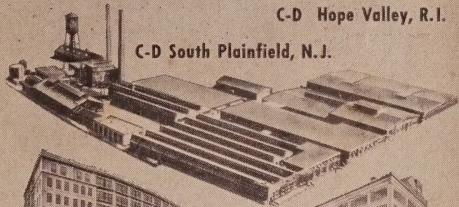


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Vol. 23

NOVEMBER - DECEMBER, 1958

No. 8

CORNELL-DUBILIER ELECTRIC CORP.
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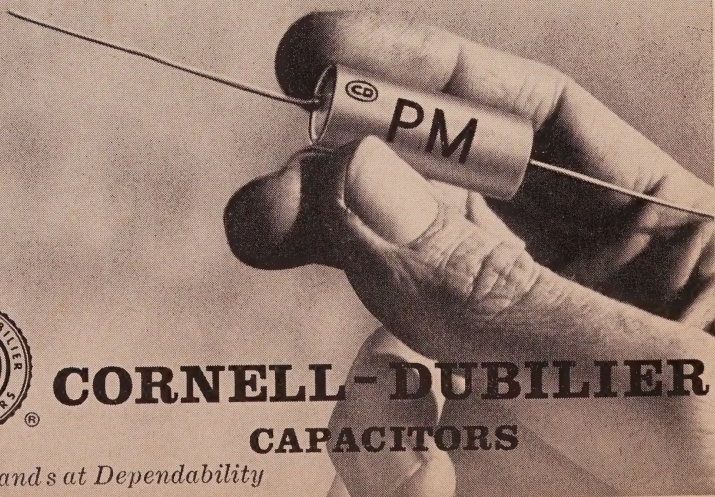
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**CORNELL-DUBILIER
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CRYSTAL VOLTMETER CIRCUITS

The crystal diode, first of all semiconductor devices is still one of the most useful. During the past two generations, this simple, passive, circuit component has passed through many stages from the fragile crystal detector of early wireless to the stable diode of modern electronics. Its applications extend all the way from toy radio receivers to giant computers.

The point-contact germanium diode offers particular advantages as a meter rectifier. It is small in size (many recent designs having sub-miniature dimensions); free from contact potential, hum, and heat; instantaneous in operation; and two-terminal in nature. As a replacement for copper oxide and similar meter rectifiers, the germanium diode offers superior frequency response and higher rectification efficiency. Where a good-grade CuO rectifier, for example, might provide a-c meter operation up to a few tens of kilocycles, germanium diodes will extend the frequency range to many tens of megacycles. Thus, a simple rectifier-type a-c meter employing a germanium diode is suitable for radio-frequency as well as audio-frequency applications.

The small size and simplicity of the crystal voltmeter suit this device for inclusion in other instruments such as oscillators, signal generators, bridges, and receivers. Because the crystal voltmeter requires no power and no zero-set adjustment, it sometimes is preferred to the v-t voltmeter in such applications.

Instrument Circuit Configuration

A crystal voltmeter consists essentially of a point-contact diode and a sensitive direct current meter. Junction diodes seldom are used, because of their restricted frequency response. To the simple diode-meter combination may be added suitable multiplier resistors, coupling capacitor, and bypass capacitor, as required for the voltage and frequency ranges to be covered.

The versatility of the crystal diode is such that any meter circuit ordinarily employing vacuum-tube or CuO rectifiers may be duplicated (often with additional advantages), provided the voltage and power dissipation ratings of the crystal are not exceeded.

Typical Circuits

Typical, practical crystal voltmeter circuits are shown in the accompanying illustrations.

Simple Diode-Milliammeter Circuit.

Figure 1 (A) shows the simplest basic circuit. This arrangement has found many applications where its sensitivity is adequate. Because this is a simple series-diode circuit, a d-c return path for the diode must be provided by the circuit under test. Thus, the A-C INPUT terminals may be connected across the ends of a voltage-carrying transformer winding, or similar "generator" having a conductive path between its output terminals. The output attenuator of an oscillator or signal generator would accommodate this meter successfully, provided the resistance included between the A-C

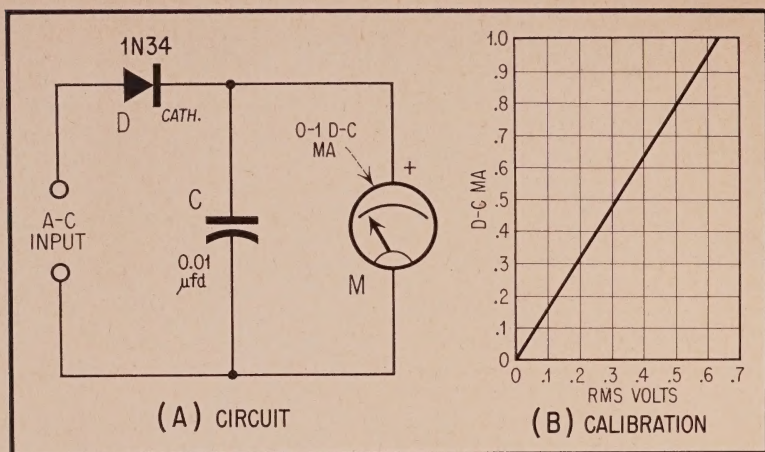


Fig. 1. Basic Single-Diode Circuit with Milliammeter.

INPUT terminals of the meter (by the attenuator arm included between them) is not too high.

Figure 1 (B) shows the voltage calibration of the circuit. Full-scale deflection of the 0-1 d-c milliammeter, M, is obtained for an input voltage of approximately 0.63 volt rms. Note that the response is non-linear, which means that a special voltage scale must be prepared for the meter.

The basic 0-6.3 v range of the meter may be extended by means of suitable series multiplier resistors. However, for low voltage values, the resistance of these multipliers cannot be calculated by the simple method used for d-c voltmeters. The reason for this is the non-linearity of the crystal diode at low forward current levels.

Figure 2 (A) shows the addition of a multiplier, R, to extend the instrument range to 0-1 v rms. This 500-ohm wire-wound rheostat may be

adjusted for exact full-scale deflection of Meter M when a 1-volt rms signal is applied to the A-C INPUT terminals. Figure 2 (B) shows the voltage calibration of the circuit. Note that the response still is not linear but becomes a little more so in the upper half of this slightly higher voltage range. At ranges of 0-10 v and higher (corresponding to higher values of multiplier resistance, R), response becomes linear except in the lower 1/10 to 1/4 of the scale (depending upon the voltage range) where the curvature approaches square law response.

While an inexpensive 1N34 diode is shown here and in several of the other circuits, successful operation is not restricted to this single type. The maximum continuous reverse working voltage of the 1N34 is 60 v. The negative half-cycle of the voltage under test therefore must not exceed this value unless the IR drop in the

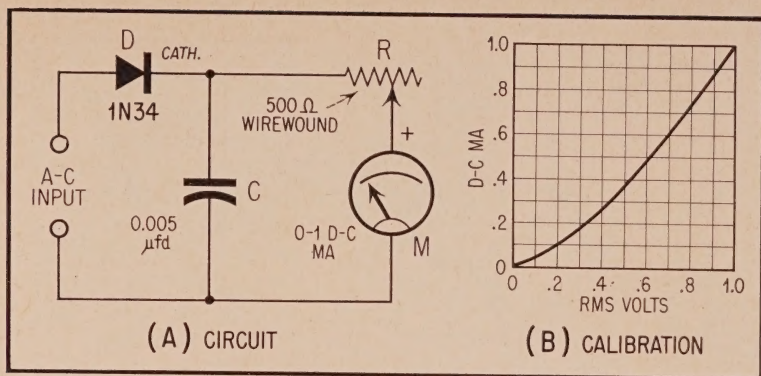


Fig. 2. Diode-Milliammeter Circuit with Multiplier.

multiplier resistor is sufficient to reduce the actual peak inverse diode voltage to -60 v. For higher-voltage applications, other diode types are available; e. g., 1N38 (100 v), 1N39 (200 v), and 1N59 (260 v).

Diode-Microammeter Circuit. The sensitivity of the basic crystal volt-meter may be increased by employing a more sensitive direct current meter in the circuit. Thus, substitution of

a d-c microammeter for the 0-1 milliammeter will decrease the full-scale deflection value.

Figure 3 (A) shows a simple series-diode circuit, similar to the basic circuit of Figure 1 (A), but employing a 0-100 d-c microammeter. In all other respects, this circuit is similar to the diode-milliammeter circuit (Figure 1A) and all remarks made concerning the latter apply also

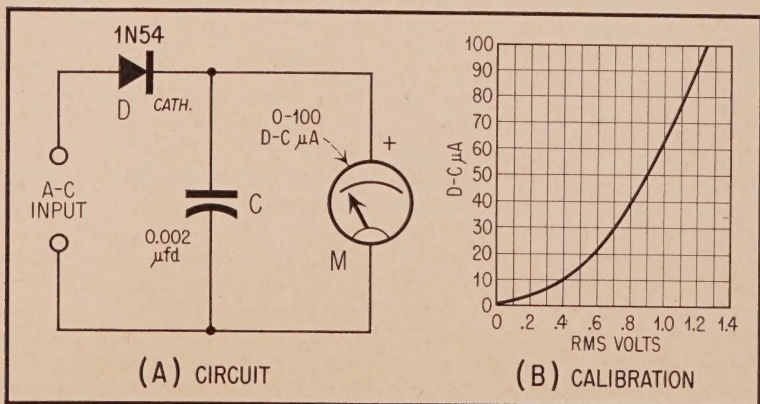


Fig. 3. Series Diode-Microammeter Circuit.

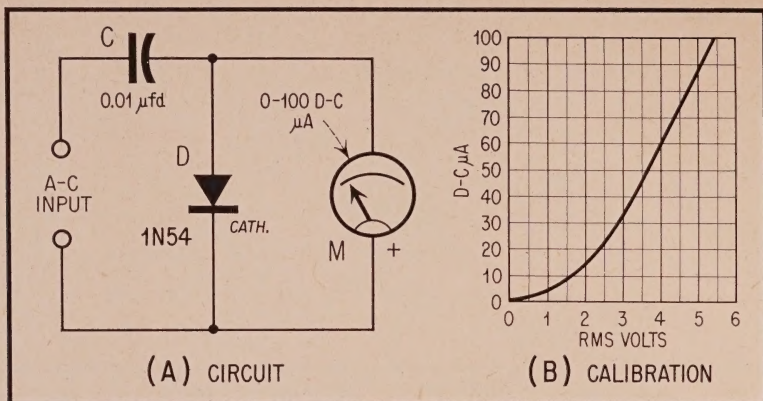


Fig. 4. Shunt Diode-Microammeter Circuit.

to this circuit. Figure 3 (B) shows the voltage calibration. Note that the 0.125 v rms full-scale deflection obtained with the microammeter circuit makes this arrangement approximately twice as sensitive as the milliammeter circuit.

Shunt-Diode Circuit. When the voltage source under test does not provide a d-c return path for the voltmeter diode (or when there is present in the voltage source a d-c component against which the voltmeter circuit must be protected), a shunt-diode meter rectifier may be employed and a blocking capacitor included in the instrument circuit. This arrangement is shown in Figure 4 (A). Coupling capacitor C isolates the diode (D) and microammeter (M) from any d-c component reaching the A-C INPUT terminals and which might affect the calibration or damage the diode or meter.

Figure 4 (B) shows the voltage calibration of the shunt-diode circuit. From this plot, note that the shunt-

diode circuit is considerably less sensitive than the series-diode circuit (Figure 3A) employing the same components, over four times as much input voltage being required by the shunt circuit for full-scale deflection.

Multi-Range Voltmeter Circuit. The principle, illustrated in Figure 2, of adding a multiplier resistor to the basic crystal voltmeter circuit may be extended to provide a multi-range ac-rf voltmeter.

Figure 5 shows an example of a multi-range circuit. Separate multiplier resistors (R_1 to R_5) for the voltage ranges E_1 to E_5 also may be used instead of the series combination shown here.

Two diodes, D_1 and D_2 , are employed. Diode D_1 provides a high-resistance shunt path for the positive half-cycle of signal voltage, while supplying an easy bypass for the negative half-cycle around the meter circuit, D_2 -M. This two-diode arrangement is used in many a-c meters

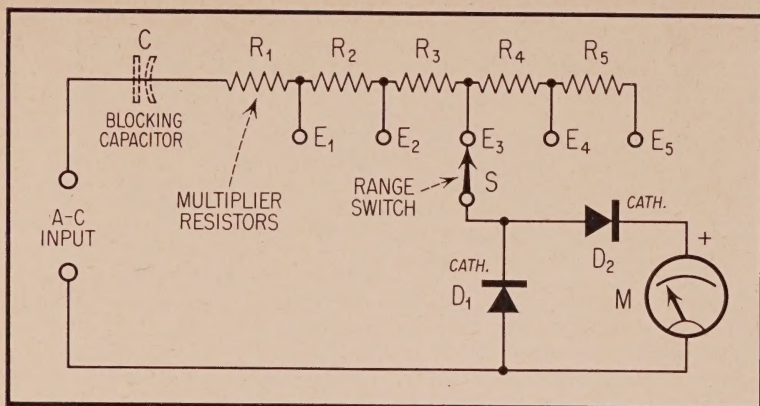


Fig. 5. Multi-Range Voltmeter.

employing CuO rectifiers. The coupling capacitor (C), when needed, serves to block d-c components from the meter circuit where they might upset the meter calibration or damage the components. The capacitance of C must be chosen such that the corresponding reactance at the lowest

operating frequency is appreciably lower than the highest multiplication resistance ($R_1 + R_2 + R_3 + R_4 + R_5$) in Figure 5.

Full-Wave Meter Rectifier. Because a full-wave rectifier circuit supplies unidirectional current to a load during both half-cycles of applied a-c voltage, greater sensitivity with a given indicating meter is obtained with bridge rectification than with simple half-wave arrangements in crystal meter circuits.

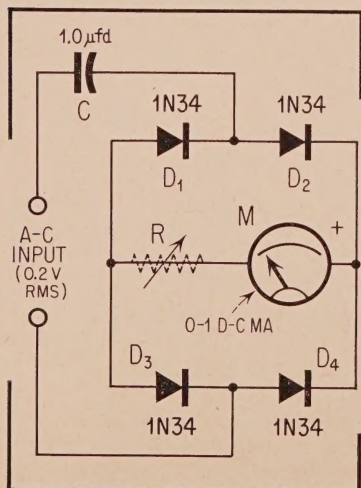


Fig. 6. Full-Wave Meter Rectifier Circuit.

Figure 6 shows a meter circuit employing a bridge rectifier composed of four 1N34 diodes, D_1 to D_4 . Full-scale deflection of the 0-1 d-c milliammeter, M, is obtained with an input signal of 0.20 volt rms. This is approximately three times the sensitivity of the simple half-wave circuit (Figure 1A) employing the 0-1 milliammeter. Coupling capacitor, C, serves to block any d-c component present in the voltage source, and thus to protect the meter circuit components and calibration.

If a higher full-scale voltage than the basic 0.2 v value is required, a suitable calibration rheostat, R, should

be included in the circuit. This rheostat is set for exact full-scale deflection with the desired input voltage (e. g., 1 volt rms) applied to the A-C INPUT terminals.

Transistorized Crystal Voltmeters. For the measurement of potentials in the millivoltage region, an amplifier may be operated ahead of a crystal voltmeter. Such amplifier-rectifier arrangements are widely used in audio engineering. For this purpose, transistorized amplifiers are convenient because of their small size and low d-c power requirements.

Figure 7 shows the circuit of a bridge-type crystal meter circuit operated from an RC-coupled, single-transistor, a-f amplifier. Full-scale deflection of the 0-100 d-c microammeter, M, corresponds to a signal voltage of 150 millivolts rms applied to the A-C INPUT terminals. The CALIBRATION CONTROL rheostat, R_4 , may be set for exact full-scale deflection when this voltage value is applied.

The circuit has an input impedance of approximately 25,000 ohms at 1000 cps. This high value results from degenerative feedback obtained by means of the unypassed emitter resistor, R_2 . Current drain from the 22½-volt battery (B) is approximately 600 microamperes dc. For compact construction, the coupling capacitors, C_1 and C_2 , may be sub-miniature tantalum electrolytics, such as Cornell-Dubilier Type TAN59A.

For higher sensitivity, additional amplification may be employed. Thus, in Figure 8, two transistor amplifier stages ahead of the bridge-type crystal meter provide a full-scale sensitivity of 50 millivolts rms. Input impedance is approximately 30,000 ohms at 1000 cps. Total current drain from the 22½-volt battery, B, is approximately 1 milliampere dc. In all other respects, the circuit is similar to the single-stage unit given in Figure 8. Frequency response is reasonably flat from 50 cps to 25 kc.

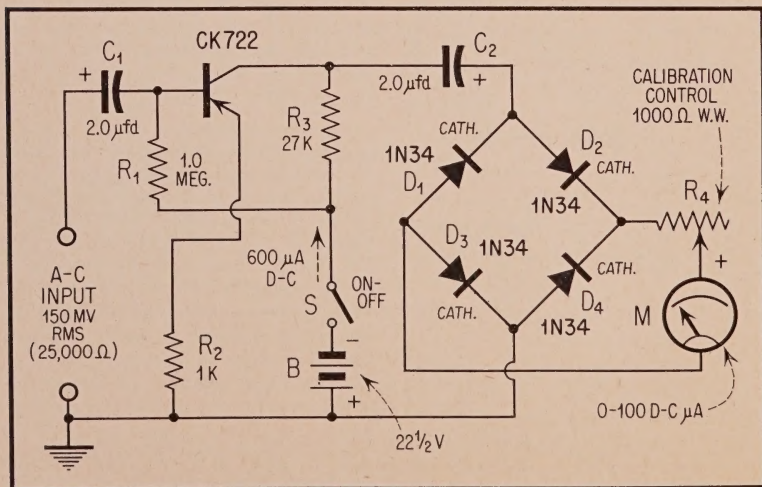


Fig. 7. Single-Stage Transistor-Diode Meter.

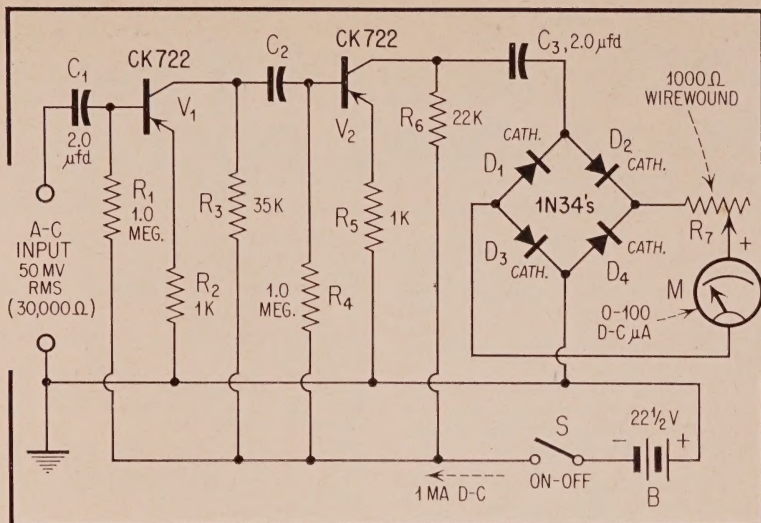


Fig. 8. Two-Stage Transistor-Diode Voltmeter.

Transformer-Coupled Millivoltmeter. When extreme simplicity is demanded and millivolt measurements are to be made across very low impedances, and preferably at a single audio frequency, a step-up transformer, instead of an amplifier, may be operated ahead of a crystal voltmeter as shown in Figure 9. Varying degrees of success are obtained, depending upon such factors as the impedance level involved and the step-up ratio of the transformer. A sensitive d-c microammeter is best, and the primary winding of the transformer should have optimum impedance for the impedance of the circuit under test. While a simple series-diode circuit is shown here, a 2-diode circuit (Figure 5) or bridge (Figure 6) might also be used.

The basic voltage range of the meter circuit is not exactly multiplied by the turns ratio of the transformer, T , because of the loading of the secondary by the diode-meter circuit.

For this reason, a special voltage calibration of the circuit must be made. Nevertheless, considerable sensitivity is obtainable by means of this potential-transformer arrangement, provided the highest usable turns ratio is employed.

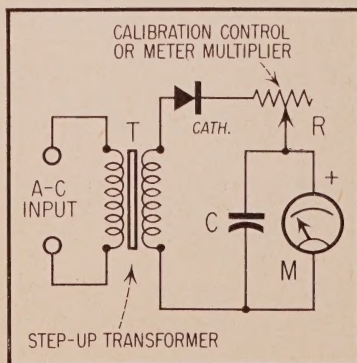


Fig. 9. Transformer-Coupled Diode Millivoltmeter.



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SELL OR TRADE — Weston 50-0-50 microammeter, model 301 3 1/2" panel meter. Preston Augenbaum, 2520 Hone Ave., New York 69, N. Y.

FOR SALE — Emico AC voltage tester, \$1.50; oscil-o-pen, \$5; 24 good used radio and TV tubes. Send for list. E. Giroux, 735 Park Ave., Hoboken, N. J.

FOR SALE — University 308 8" Triax speaker, \$20; Precision 10-54 tube tester, \$95; crystal mike, \$1. All exc., ship C.O.D. Johnnie, 85-61 66 Rd., Forest Hills 74, N. Y.

WANTED — Hickok 6000 tube tester; IB-2A Heath impedance bridge; Heath GD-1B grid dip meter. All good cond. For money, no swap. Clay Nottingham, 1332 Shattuck Ave., Berkeley 9, Calif.

WANTED — Good used 190-410 Kc portable radio rcvr. and 27.255 radio control equip. M. J. Oprendeck, 123 Benita Ave., Youngstown 4, Ohio.

FOR SALE — Simpson 260 VOM, exc. cond., \$25. Harry Kay, R. 2, Box 255, Imlay City, Mich.

TRADE — 3 tube 10 meter broadband converter for similar 2 meter job. Robert Cough, 29-29 213th St., Bayside 60, N. Y.

FOR SALE — Practical and Advance Radio course, 16 vols., 1. n., \$40; Fisher 50 M mixer, \$5; Mohawk Midgetape pocket recorder, case, instructions, 1. n., \$50. C.O.D. plus postage. Broadway Electric, 953 Broadway, Dunedin, Fla.

WANTED — Technical manuals for BC-640 transmitter, BC-638 freq. meter, RC-153 antenna and RBK UHF Navy rcvr. C. R. Wilson, 61 Warwick, Portland, Maine.

FOR SALE — Home brew transmitter, 35 w. CW and phone, complete with modulator and power supply, home brew rcvr. covers all ham bands, PA-27 mike, will trade for 6 meter communicator or other equipment, or cash. Robert Sherman, 8871 20th Ave., Brooklyn 14, N. Y.

SWAP — Model 1877 Regal 3-way portable radio with tubes for FM rcvr. 30-50 mc complete with tubes. Thomas Bradford, 427 Beach 69th St., Arverne 92, N. Y.

FOR SALE — Perfect DX-100 with Dow ant changeover relay, no TVI, little used, will sked on 40 mtrs, \$180. R. Wall, 634 W. 135 St., New York 31, N. Y.

WANTED — Triplett: 650 VTVM, 1270A and 2470 appliance testers; Wheatstone bridge; Hickok 900 wattmeter; decade resistance. Bert Emery, 5729-23 Ave. So., Minneapolis, Minn.

SELL OR TRADE — Sentinel model 400 7" portable TV set complete with 21 tubes and leather case, exc, \$20 F.O.B., or good hi-fi tweeter for condenser checker. M. W. Driskell, 407 Lauderdale St., Selma, Ala.

FOR SALE — Johnson Viking II xmitter, exc. cond., best offer accepted. Will sell direct only, will not ship. Rocco Champi, 6 W. Washington Ave., Atlantic Highlands, N. J.

FOR SALE — Sams Photofact folders between 50 and 199, 1. n., \$1 each, also TV tubes cheap — send for list. H. H. Seabrook, 36 Branch Ave., Freeport, L. I., N. Y.

WANTED — Precision EV-10S VTVM; Millen 90651 grid dip meter with coils, and 90605 through 608 absorption freq. meters; C-D BF-59 cap-res bridge; Hobart Megger. State price, cond. David Dunham, Box 221, Duxbury, Mass.

WANTED — All type of TCS receiving and xmitting equip., power supplies and cables for same. Lloyd Randeau, 2436 Carney Ave., Marenette, Wis.

FOR RENT — 1 man radio shop with small quarters, modern building, in Southern Calif. climate, 75 miles from LA and San Diego. Write "Radio," Route 1, Box 76, Elsinore, Calif.

WANTED — Complete RCA Radio and TV home study course, 1953 or later. Will sell Precision tube tester for \$50. Send details and price of course. Charles Levine, 259 Hopkins St., Brooklyn 6, N. Y.

SELL OR TRADE — Perfect Kw Ham beam antenna, 10-15-20 meter band, factory tuned and prematched. Best offer. Edward Svoboda, Wilber, Neb.

FOR SALE — Two power supplies, each delivers 480 v. @ 300 ma, metered and 6.3 v. @ 4.7A and 0.6A, UTC transformers, Stancor chokes, \$25 each, or both \$45. L. D. Harmon, Old Stirling Road, R. 2, Plainfield, N. J.

FOR SALE — Sams folders 194-355 with 11 binders, 11 folders missing; Jackson TV sweep and marker model TVG2. All in exc. cond., best offer. Kenneth Zimbelman, 1218 Pinecrest, Garden City, Kan.

FOR SALE — Gonset G77A xmitter factory sealed, \$249; Elmac PMR7, \$109; PMR 6 with 6 v. supply, \$89; Millen grid dip osc. and coils, \$43; 4D32 tube, \$17. All guaranteed new cond. F.O.B. Treger, 2023 N. Harlem, Chicago 35, Ill.

FOR SALE — 3 tube, cascade xtal 2 meter converter, 7 to 11 mc IF, \$10 plus postage; 2 tube 10 meter tunable converter, 1500 kc IF, \$7.50 plus postage. Stanley Ackerman, 57-47 Marathon Parkway, Little Neck 62, N. Y.

FOR SALE — Little used Knight 50w CW xmitter plus xtals, \$30. G. F. Goble, 1454 W. Melrose St., Chicago 13, Ill.

WANTED — Either or both schematics and operating and instruction book for NC 100 ASD or for any NC100 series. Jerry Elprin, 33 N. Forest Circle, West Haven, Conn.

FOR SALE — Riders Radio manuals vol 1 to 3 abridged and 10 to 13. No reasonable offer refused, F.O.B. Homer Shattuck, 33 Rosemere St., Rye, N. Y.

WANTED — Radio case for Fada 845, or complete radio if case is ok. R. V. Nelson, 938 So. Vine, Denver 9, Colo.

FOR SALE — A.T.R. inverter, model L1A, 110 VDC to 110 VAC; Maica and Beltone hearing aid, GE DW-68 exposure meter (needs repair), make offer, will sell cheap. D. Spencer, Jr., 4607 Cherry Hill Rd., College Park, Md.

TRADE OR SELL — Eico, 214 VTVM 1. n., instruction manual incl., \$35 or trade for 8" or larger tilt arbor table saw, hi voltage probes inc. Lorn Rogge, Box 613, Danbury, Iowa.

WANTED — Good used 16 mm movie camera, operating instructions and schematic for Precision apparatus EV-10-S multimeter. State lowest cash price for each. John Lellelid, Box 16, Colman, S. D.

FOR SALE — Presto overhead recording lathe, Green Flyer two-speed 12" turntable, 2 xtal pickups, all mounted on mahogany base; Webster 8 OHM recording head, needs minor repair, \$40 fob. E. Cowden, 6212 Zelzah Ave., Reseda, Calif.

FOR SALE — Like new with cables Precision E-400 sweep gen., \$70, E-200-C gen., \$35, police type "Comco" VHF xtal con., 6 v. rcvr., \$35, 12v-375v at 325 MA dynamotor, Carter, \$10. J. R. Driver, 1710 Pamela Dr., Richmond, Va.

FOR SALE — Precision E-400 sweep generator, \$85. George W. Stoner, 905 Spring St., Gadsden, Ala.

BEST OFFER — Radio Electronics magazines in excellent cond. from October 1953 to Sept. 1958. L. E. Polikoff, 22 Shelly Lane, Bethpage, L. I., N. Y.

SWAP — Green concert amplifier, Eico xtal. radio and old books. Charles Radio Service, 81 Warren St., Roxbury 19, Mass.

WANTED — Reasonably complete set of Rider's TV or Sams. Will pay fair price for usable material. Send details. R. Hansteen, 2800 Disston St., Phila 49, Pa.

WANTED — Precision EV10, EV10A, and EV20, VTVM; RCA 162C-channelyst. State price and condition. Francis Lewandowski, 4 Carvel Ave., Manor Park Apts., New Castle, Del.

SELL OR TRADE — General Radio 804, 720A, 620-A, 583-A; Hewlett-Packard 200-C, 200D; L & N type S bridge. Want Bonton 160-A, 170-A, Q meter; General Radio 650-A or Ap, 605-B, 805-C. William Pendergast, 9777 E. Hasket, Dayton 24, Ohio.

WANTED — National NC 100 X. Cash or swap Heathkit, TC-2 tube checker, 1 n. Leo Brandt, 11509 Oelke Rd., Maybee, Mich.

TRADE — Xtal sets, hearing aid, metal locator, xmitting tubes, TV service sign, books, transistors, diodes, and small parts. John Haynes, Box 342, Doe Run, Mo.

FOR SALE — Bell RT65B tape recorder, three speeds, $7\frac{1}{2}$, $3\frac{3}{4}$, and $1\frac{1}{8}$. In excellent cond. \$75. Liebrechts TV, Ottoville, Ohio.

WANTED — Power tubes 810; V70D; HF or UE100; UE468; FV20. Swap Heath sig. tracer, gen., tube tester, scope. Al Aaron, Basement, 3619 Eastern Ave. NE, Washington 18, D. C.

FOR SALE — Realist FM tuner from Radio Shack, good cond., \$25. Kirk Lumsden, 1103 Arney St., Elizabethton, Tenn.

FOR SALE — RCA 40 watt mobile transmitter, 6 v, complete with all controls, mike, cables, etc., \$60; Lysco 600-S exciter with built-in modulator, \$55. All guaranteed perfect, both fob. Fred Kloepper, 649 W. 23rd St., Lawrence, Kan.

SWAP — Hammarlund HQ-140-X rcvr., excellent cond. for Omega D2 enlarger with Omegalite head. J. McIntire, 39 W. Monument Ave., Dayton 2, Ohio.

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WANTED — NC-88 or other short wave radio. Have cash or will trade parts. Klaus W. Engel, 1616 Haight Ave., Bronx 61, N. Y.

FOR SALE — Radios, speakers, many parts dating back to early 20's, also books. C. M. Sinnott, 320 Salem St., Medford 55, Mass.

WANTED — Will pay \$75 to \$90 for scope such as: RCA WO-88, Triplett 3441, Precision ES 500A, or Hickok 670. Must be in perfect working order. Latham Radio & TV, Cuba City, Wis.

WANTED — Old books on radio and wireless, and early books about cars. Give full description of cond. and price. Glenn Godwin, Box 368, Binghamton, N. Y.

TRADE — Perfect Hallicrafter novice transmitter complete for ham rcvr. Karl Stello, 4504 Hartwick Rd., College Park, Maryland.

TRADE — Amprex 5894/AX9903 dual tetrode, excellent for 2 meter. Need 2.5 v @ 10 amp. fil. transformer. Trade even. Edison P. Bell, 34 Curtis Ave., Baldwinsville, N. Y.

WANTED — Portable TV, need not be working; color TV in good cond.; transistor portable, 152-174 Mc FM rcvr. Have Electro-Voice UHF TV booster, RCA WV65A voltohmmyst, DB 20 pre-selector, panel meters, tubes. W. W. Cashwell, 213 S. Woodlynn Ave., Tampa 9, Fla.

WANTED — McMurdo-Silver Masterpiece V or VI radio or any one unit for above, also parts and circuit diagram. John Furey, 807 Reed St., Olean, N. Y.

WANTED — 5541, 2C51, GL-6134, 350-A, 350-B and other tubes, commercial FM transmitters, frequency monitors, studio equipment. State price and condition. Bruce Weitermann, 1412 North 30th St., Milwaukee 8, Wis.

WANTED — Scopes, in any cond., with or without CR tubes. Pay up to \$10 each. To be used by school radio club. Leon S. Recht, 430 E 67 St., New York 21, N. Y.

WANTED — Late Radio-TV course with or without kits. Ed Staffan, R 1 Doak Rd., Midland, Ohio.

WANTED — Hallicrafters SX-71 or other good communications rcvr., will pay cash. Local preferred. Gerald Goldstein, 188 Ten Eyck Walk, Brooklyn 6, N. Y.

FOR SALE — Eico electronic 488 switch, \$27; Heath voltage calibrator VC-3, \$14; Heath scope O-11, \$75. Michael Bilgrel, 146 Hewes St., Brooklyn 11, N. Y.

WANTED — For cash, commercial ham rcvr. and transmitter, lab test equipment and unused special purpose tubes. B. N. Gensler, 512 Broadway, New York, N. Y.

TRADE — Sprague, Tel-O-Mike 16D for good 500 w 8 mm projector. Sell Radio Riders 4-6 through 21 in excellent shape, \$100. R. E. Martin, 2702 1st West, Seattle 9, Wash.

WANTED — 6 meter transmitter with power supply, put out 100 to 200 w for phone; car converter 6 v, 10, 20 meter bands. Have amplifiers from 40 to 100 w, speakers, mikes, driver units, ham equipment, and cash. John Arnold, Wilson St., Bluffs 3, Ill.

FOR SALE — Majestic Mighty Monarch of the Air 850 radio, BC, amateur police, foreign bands, console cabinet, very good cond. Make offer. John Strazza, 48 Pulaski St., Bloomfield, N. J.

SELL OR TRADE — 8-832, 6-829-Bs, 3-815, 10-811, 6-100T, 6-127, 3-4E27, and 8-866; BC-639 rec., WR36-A color-dot gen., all in good cond. Gil Howarth, 216 1st Ave. East, Oskaloosa, Iowa.

SELL OR TRADE — Perfect BC 611 walkie talkie, also batteries. Best offer. A. L. Friel, 9 Jill Lane, Trenton 8, N. J.

WANTED — Radio Craftsman tuner RC-10-AM and FM or equivalent. Give price, condition and specs. J. J. Mueller, Manchester, Vt.

FOR SALE — High output (24-30KV) automobile ignition coils, specify 6 or 12 volt. Primary, \$7.50 @ ppd. Frank Anderson, 10 Stratford St., W. Roxbury 32, Mass.

FOR SALE — Holmes Institute course. First money order for \$35 takes it. Rest returned. Jack Berman, 19 Washington St., Dorchester 21, Mass.

WANTED — Vernier knob for Collins rcvr. J. Taylor, Stanwood Rd., Mt. Kisco, N. Y.

FOR SALE — 50 perfect GE 6T8 tubes, test ok, no factory warranty, \$25 or best offer. Theodore F. Sassi, 446 Samuel Gorton Ave., Warwick, R. I.

FOR SALE — 650 Hickok videometer for color or black and white, 1. n. cond., \$99.50; Norelco projection TV with cabinet hi volt supply, \$35; Heath 0-10 scope, \$49.50. All fob. S. H. Jarvis, Jr., 20640 Sunrise Dr., Cupertino, Calif.

FOR SALE — Two 11 amp filament transformers wired as line voltage boosters, one gives 5 volt boost, other 6 volts, \$3.50 each, \$6 for both. Martin A. Weiner, 2927 Holland Ave., New York 67, N. Y.

FOR SALE — Industrial Training Institute Radio & TV course, 72 lessons complete in binders, 1. n., \$35. H. R. Grafton, Yelm, Washington.

SELL OR TRADE — 2 xmitting tubes, 1B35/3D23, \$5 each; dynamotor, Gothard input 5.6 VDC, 32 amps, output 500 VDC, 225 Ma, \$10; Supreme radio tube tester, good cond., \$20. Or what have you? Glynn McCreary, 1651 NW Dogwood Dr., Roseburg, Ore.

SELL OR TRADE — NC57 rcvr., 833A, 813, 6 and 12 volt dynamotors, Q5er, multi-band mobile antenna, many parts and tubes. Need beam or beam materials. Dean Townsend, R 12, Box 271G3, Indianapolis, Ind.

FOR SALE — Radio News, Aug. 1920, Dec. 1922, 24 issues 1923-1926. All for \$27.50 postpaid. R. Conover, Stoneridge, New York.

SELL OR SWAP — Triumph 830 scope with wobulator. Features: Thyatron linear sweep, 4 volts/incl. sensitivity, 10-100,000 cps, response with low capacity probe. Excellent cond., best offer over \$15. George Desalvo, 1097 East 3rd St., Brooklyn 30, N. Y.

TRADE — Radio tubes, AC DC volt-meter, 2 telephone handsets, intercom, 3/4 hp motor for U. S. Army .45 cal. auto. pistol, Colt or Remington Rand. George Easton, 2007 Eagle St., Baltimore 23, Md.

WANTED — 6-meter gear. Will buy or swap for what have you? Stanley Koscink, 206 Hawthorne Ave., Newark 12, N. J.

FOR SALE — Two SCR-300 (BC-1000) transmitter-rcvrs., 40-80 Mc FM with pp-114/URC power supply, 6, 12, 24 VDC, \$40 each, \$75 for both fob. A. Severance, 839 No. Elliot, Coquille, Ore.

SELL OR SWAP — Two perfect UHF converters 14 thru 83 channel RCA WR-21A and Granco SLU. Want Simpson 260 VOM or equivalent. Frank Grebel, Brown Hill Rd., Boston, N. Y.

FOR SALE — Eico 460 scope, 6 mos. old, \$65; Eico batt. elim., \$30; Knight VTVM, \$20; Superior tube tester, TV-12, \$60 or \$160 for all. Dominick Colabella, 23 Congress St., New Rochelle, N. Y.

FOR SALE — Heath TC-2P portable tube tester, 1. n. A. H. Steinberg, 18-24 Jordan Rd., Fair Lawn, N. J.

FOR SALE — Complete, geiger counter, Hoffman Hunter 2231, 3 ranges, plus extra sensitive hunt range, fast slow time constant, batteries, carrying strap, probe, radioactive standard, \$100. H. R. Small, 608 Gardner Ave., Glenolden, Pa.

WANTED — Surplus RCA 500 w modulation transformer. Sell 6-meter gear and 522 transmitters. E. L. Felder, Box 148, Tylertown, Miss.

FOR SALE — Never used, Hickok Video-Generator 650 (can be converted to 650-C for \$5 for color service) and Sprague's TelOhmike TO-4. Both with instructions for \$175 cash. E. Leroux, 5203 So. Harper, Chicago 15, Ill.

FOR SALE — Collectors items: radio technical books. Early editions, 30 years old, A-1 cond. Write for complete information. C. W. Cooley, 319 Haines St., Kane, Pa.

FOR SALE — Heath AG-8 audio gen., \$20; RF sig. gen., 315 K, Eico, \$30; model 324, \$24. David Pollock, 178 Pinckney Rd., Little Silver, N. J.

FOR SALE — Riders 1-5 abridged and 6 thru 20 Radio Manuals plus 1 thru 5 TV, excellent cond., \$100 for lot delivered anywhere in USA. Stuart Meyer, 1103 Kent Pl., Linden, N. J.

SELL OR TRADE — Mosley beam 10/20 meter full size. Want Johnson 275 w match box. U. Koski, 5 Allston Court, W. Medford, Mass.

FOR SALE — 385 Supreme, 1. n., \$50. C. Dennison, 1539 Maple St., Pasadena 4, Calif.

SELL OR TRADE — Rider's TV Manuals, 1 thru 5, 1. n., \$6.50 each fob; Hickok 305A-3" scope, \$35, 1. n.; RCA Aero pressure and Turner 22X mikes. Nick's Radio, 170 Wellington Rd., Elmont, L. I., New York.

WANTED — Schematic and alignment instructions for Hallicrafters SX-28. State price. G. W. Hemphill, 22 Cottage Grove Circle, Bloomfield, Conn.

FOR SALE — NRI VTVM with case and HF probe, \$25 or best offer; 8" hi-fi spkr. with 8oz. magnet, \$10. Karl D. Cox, 5728 Winthrop, Apt. 303, Chicago 40, Ill.

TRADE — Meissner sig. booster; Mackay LF rcvr.; radio and math books; 18" slide rule; Hickok 3" scope; BC312; meters; German binoculars; deluxe vibroplex with case; etc., for VTVM, old coins, or what? Percy-Ott, 507 Juniper St., Quakertown, Pa.

FOR SALE — Perfect Cosmic electrolytic 25mfd @ 50 v DC, 20c each, 2 for 35c; home brew 6 meter walkie talkie complete, \$15, up to 1/2 w output, plate mod. E. J. Wolitzer, 2143-82 St., Brooklyn 14, N. Y.

FOR SALE — Two BC 348 rcvrs., \$50 each. Fine cond. with dynamometers. Freight extra. B. Beardsley, 503 E. 36th St., Tucson, Ariz.

FOR SALE — Heathkit AR3 communications rcvr. and QF1 multiplier, factory aligned and tested. Excellent working cond. Best cash offer. D. Landesberg, 179 Marcy Ave., Brooklyn 11, N. Y.

WANTED — Electronic organ diagram and parts; bench model master volt ohmmist with good meter regardless of cond; large up-to-date scope. John A. Williams, 1385 Bryan St., Memphis, Tenn.

BUSINESS FOR SALE — Complete Radio and TV Service Shop, established 3 1/2 years. Serving area of 50,000 pop. Inquiries invited. J. J. Hunker, 9413 Alta Mira, Dallas, Texas.

FOR SALE — Philco 7050 tube tester with up-to-date charts, \$48; DeJur TK820/3D dual-professional tape recorder, built-in 3 speakers, \$365; DeJur 5080 AM-FM tuner chassis, 5 speakers, \$250. Both like new. Send 25%, rest COD. L. Kiraly, Riverside, Box 4254, Kitimat, B. C., Canada.

FOR SALE — KW PA PP 813's 80-10M shielded and filtered with power supplies, meter panel and TVI screened 6" rack, \$200; LM-13 freq. meter with book, \$60; TBY-7 transceiver, mic, headset, \$20. Harry Burhans, 5849 Hadfield St., Philadelphia 43, Pa.

FOR SALE — 5" scope, 10 Mc bandwidth, needs some repair and tubes, \$15; 5" scope all major parts, \$5; components for 500 v 1 amp power supply, trans., chokes, and condensers, \$10. Arthur Bonte, 3138 Kingsbridge Terr., Bronx 63, N. Y.

WANTED — 1954 Chevrolet auto radio in working cond. Quote best price. S. Bossey, 69 E. Suffolk Ave., Central Islip, L. I., N. Y.

FOR SALE — Gonset communicator II, two meters, for 12 v DC and 110 v AC with all cables including mobile ant., carbon mike and xtal. Excellent shape, \$145. J. Keller, 514 Stevens Rd., Morrisville, Pa.

FOR SALE — Hallicrafter S76 rcvr. with spkr., \$90; Harvey-Well xmitter, TBS50D, \$60; Heath VFO, \$12. Herbert Spilger, Cardinal Lane, Monsey, N. Y.

CASH — For your obsolete or surplus parts. Must be perfect and reasonable. Trinka, 815 Central, Hamilton, Ohio.

FOR SALE — GE wet cell battery portable radios: model 160, \$20; 250, \$25; 260, \$30, with short wave ant. All good operating cond., fob. M. S. Blemly, 23710 Samoset Terr., Birmingham, Mich.

FOR SALE — Training course in Radar, as taught to flight crews along with classroom notes on the RCA AVQ-10 WX radar system, \$10. C. Derapelian, 945 E. 180th St., New York 60, N. Y.

SELL OR TRADE — Two facsimile transceivers model TT1B/TXC1, \$50 each; 2 UHF lab. sweep sig. generators, \$65 each. J. W. Phillips, 37 Biltmore Terr., Belleville, Ill.

SERVICE — Electronic kits wired and tested. Send prepaid plus 20% or send kit cost plus 25%. Work guaranteed and expertly done. Fast service. Kits shipped fob. Vernon E. Hopler, 311 Dixon Ave., Boonton, N. J.

FOR SALE — NRI advanced TV course, kits and manuals incl. 17" pix tube, pix and sound all channels. Will ship western states for \$130. George E. Riedel, 13646 Berg, San Fernando, Calif.

WANTED — C-D Capacitor, Radio News, Radio Broadcast, Science & Invention, Electrical Experimenter. Joseph Simpson, 85-39 152nd St., Jamaica 32, N. Y.

FOR SALE — 3 x 0.2 mfd @ 4000 VDC capacitor, bottom plate mtg. $4\frac{5}{8}$ x $2\frac{7}{8}$ x $5\frac{1}{4}$ ", \$2. J. C. Zilinsky, 629 E. Sixth St., South Boston 27, Mass.

FOR SALE — Hallicrafter S-76 rcvr., excellent cond., newly aligned, plus matching speaker, \$125. William B. Stein, 315 Carroll Ave., Mamaroneck, New York.

SELL OR TRADE — Garrard RC60 changer, \$17. Want Heathkit WAPI. Vincent Pellettieri, 5523 31 Ave., Woodside 77, L. I., N. Y.

FOR SALE — RCA WR-46A video dot/crosshatch gen., perfect cond., \$100 cash. Bill Kitchen TV Service, 1121 Waddell Ave., Albany, Ga.

FOR SALE — Jackson tube tester md. 648, \$50; RCA JR.WV-77A VTVM includes xtal diode probe WG-264, high voltage probe WG-289, and WC-217 DC. probe, and WG-218 direct probe, \$50; Walsco alignment tool kit, \$5. Daniel Basile, 1212 So. Wenonah Ave., Berwyn, Ill.

SELL OR TRADE — Gonset 30-40 and 40-50 Mc FM converters, perfect, \$15 each; Monitoradio FMC-1 crystal controlled rcvr., 30-50 Mc, \$30. Want pantagraph engraving machine, pre-1925 fire engine, .357 or .44 Magnum pistol. Give or take difference. T. B. Minton, Box 13, 127, Dallas 20, Walnut Hill Station, Texas.

SELL — Viking 2 with VFO relay, low pass filter, monimatch SWR-power indicator, \$245; HQ129X factory realigned, perfect shape, speaker, \$125. Both for \$350. N. Y. area only. M. Heuvelmans, 62-07 Alderton St., Rego Park 74, N. Y.

WANTED — VTVM or VOM; In-Circuit type checkers for capacitors and resistors. State price and cond. Leo Adas, 1842 No. Keystone Ave., Chicago 39, Ill.

SELL OR TRADE — For stamps — Superior TV-11 tube tester, excellent cond.; CETI Radio and TV course complete, less kits. Best offer. Gordon R. Myers, 162 Balview Ave., O. V., Norfolk 3, Va.

WANTED — Instruction books, service manuals, any technical data on Supreme 581 sig. gen. and freq. modulator and 562 audolyzer. Joe Gibbons, 18 Liberty St., Port Jervis, N. Y.

FOR SALE — Viking Ranger, good cond., \$195. Peter Pietropaolo, 544 Main St., Medford 55, Mass.

WANTED — Measurements 65 or 82 or Microvoter of similar frequency range or quality. Sell or swap RCA 710, 370 to 560 Mcs., Hickok 215 VTVM, RCA chanalyst 162C, Blonder-Tongue BTU-2 converter. Rudy Kulmus, Westmoreland Rd., Whitesboro, N. Y.

SELL OR SWAP — RCA Pictoguides vols. 2 and 3-in very good cond. Best offer. Stan Wieczorek, 2100 Corbin Ave., New Britain, Conn.

FOR SALE — Good National NC-98, newly aligned and calibrated, \$110; 10m mobile ST-203A, excellent operating condition, includes installed meter, \$25; 96" stainless steel whip, \$2.50. All tob. Budd Meyer, 105-10 65th Ave., Forest Hills 75, N. Y.

WANTED — Stancor power trans PC-8414 or equal, 1200 v, 200 ma; 5 v, 3 A; and 6.3 v, 3 A. State cond. and price. Edwni C. Eisenbeis, 2813 Sheila Dr., Louisville 5, Ky.

FOR SALE — Trav-Electric super converter 6 v input-110V-60 ohm, 60-75 watts, \$19; battery charger 110 v input, output 6 v 2-4 amps, \$4.50. H. M. Love, 4993 Grace Rd., North Olmsted, Ohio.

FOR SALE — All parts and equipment in radio and TV shop: Sams, Raytronic Beamer, Jackson 648 tube tester, many other instruments, repair parts, etc. Write for complete list. Charles J. Moore TV, Box 216, Wolfe City, Texas.

WANTED — Back issues of RTTY magazine. State issues available and price. Also need single space gear, receiving distributor and sync motor for model 12 teletype. N. Oland, Box 212, Rononkoma, N. Y.

FOR SALE — UHF converter, continuous tuning, Granco MTU, \$12; Gm and Em tube tester, Precise 111, \$60. Both guaranteed perfect cond. J. V. Bedell, 1647 New Scotland Rd., Slingerlands, N. Y.

FOR SALE — Hallicrafter rcvr. S76 with xtal calibrator. John V. Hogan, 307 Burns St., Forest Hills, N. Y.

FOR SALE — Riders Radio Troubleshooters manuals 1 to 5 abridged, 6 thru 14 in good cond., \$30 for lot. Emil Witt, 2980 Passmore Dr., Hollywood 28, Calif.

SELL OR TRADE — Sun tack and dwell meter, needs repair, \$15; 4 x 5 speed graphic, \$60. Want hi-fi parts. Ed LaRue, 34 N. Marshall St., Lancaster, Pa.

FOR SALE — Ham band xtals, not etched surplus, 95c each, frequencies in KC-7034, 7040, 7041, 7050, 7051, 7062, 7072, 7073.333, and 7075. Bob Brown, 67 Russell Ave., Rahway, N. J.

FOR SALE — Standard coil strips, 16, 18, 30, 55, 61, K, 30, 55, R; 61F/G; 53Q, \$2 per set; RCA Pict-O-Guide vol 3, \$4.50; RCP flyback 123 with manual, \$25. Simscraft Service Center, Box 444, Simsbury, Conn.

WANTED — Sub-contract work for electronic sub-assembly and/or finished units. Electronic devices design and/or built to your specifications. Martin Golden, 209 East 165 St., Bronx, N. Y.

SALE — All 23 vols Riders Radio, \$195; All 23 vols Riders TV, \$229; BK 500, \$45; BK 350, \$40; Hickok 225, \$59.95; Jackson T.V.G.I.; Webcor Royal Coronet 2612-1A, \$119.50 and 2010-1, \$85. All perfect cond. A. Campbell, 78 Main St., Dublin, Pa.

FOR SALE — NRI professional TV servicing course complete with kits, \$90 cash, shipped postpaid in U. S. Robert Schrantz, 231 Maple Ave., Dunkirk, N. Y.

FOR SALE — Columbia 105 manual 3-speed record player with LT4-AG cartridge, and extra 16L-3 astatic cartridge, complete, \$10; 33A Utah AC dynamic speaker, 8" cone, \$5. Both like new. Joseph L. Steinhagen, 15 Stratford, Ave., Westmont 7, N. J.

WANTED — Pilot 3" TV in good or repairable cond. State cond. and best price. Joseph Saurer, 4458 West 59th St., Chicago 29, Ill.

WANTED — Sams Photofacts 228 and 232 thru 240 and 242 thru 249, also 295 to date excluding 325, 330 and 341. State numbers available, cond., and cash price. Earl W. Wells, 223 N. Philadelphia St., Shawnee, Okla.

FOR SALE — Unused SCR-625-F mine detector, operates on any metallic object. Complete, with manual, \$35. Thomas G. Dalby, 7421 55th Ave. NE, Seattle 15, Wash.

FOR SALE — QST 1929 to 1952 less 6 issues; IRE Proceedings 1926-1928; Electronics Sept. 1935 to Sept. 1940; Radio Jan. 1934 to March 1942. Make offer for each lot. A. J. Douglas, 1401 Amador, Concord, Calif.

WANTED — Hallicrafter S19R repairable or? Have 2, 3, 4, gang tuning condensers, 10c each; TV booster, \$4; Philco diagrams '46 to '50. Trade for Supreme manuals. J. Leach, Box 336, Milton, Del.

SELL — Electrocardiograph machine, direct writing, hot stylus type; Cariotron PCIA, with leads, as is, \$35 fob. Jerry Tannenbaum, 5240 S. Harper, Chicago 15 Ill.

SELL OR TRADE — Volume indicator 600 ohms input, rectifier RA-62-C (SCR 522), DuMont 3" scope; Simpson 330 tube tester, Teletype polar relays. Need teletype machine later than model 12. Henry Galbraith, 1214 South Alvord Blvd., Evansville, Ind.

ATTENTION — Wish to correspond with hams maintaining small privately owned telephone switchboards up to 200 lines. W. Kemper, 825 NW 149 Terr., Miami 68, Fla.

SWAP — 35 books on Electronics and Electron Engineering, prac. new., for good speaker. Prefer 15" Altec 604-D. Will ship. Thomas Ravesi, 99 Rockridge Rd., Waltham 54, Mass.

WANTED — Several working Citizen Band 1-5 watt transceivers-xtal controlled, 6-12 v supply. Commercial units preferred. Give complete information. R. H. Homesly, 720 E. Cypress St., Compton, Calif.

FOR SALE — Heath: bat. eliminator, RF sig. gen., tube checker, cond. checker, capaci-tester, in A-1 cond., all for \$100; 240 RCA and GE tubes in original cartons, all for \$300. Lauck Electronic Service, Box 553, Glenwood Springs, Colo.

SELL OR SWAP — Small air compressor to 200 lbs. l. n., automatic start and cut off (appraised \$100) for scope in good working cond. Give specifications. Guzman, 109-48, 133 St., So. Ozone Park 20, N. Y.

FOR SALE — RCA 300 sq in. projection TV rcvr., perfect cond., \$150. Sol Steinfeld, 52 Legion St., Brooklyn 12, N. Y.

TRADE — RCA TV servicing course (10 books) late edition for Radio & TV servicing by NRI. Books only. Don Meek, 210 N. Rock, Sheridan, Ark.

TRADE — Superior tube tester TV11, good cond. with new tube chart, for cash if reasonable, or any field strength meter. L. L. Howard, Tunnelton, W. Va.

WANTED — Heath audio test equip. AA-1, HD-1, AG-9A, SQ-1. Must have instruction books, would prefer in working cond. State cond. and price. Tee Vee Service Co., Ellis Dr., West Falls, N. Y.

FOR SALE — Hickok 19XD sig. gen.; Precision tube tester and VOM; transvision CRT tester and reactivator; Rider's 1-5 abr., 10 and 11; out of guarantee radio tubes; Radio & TV books. T. Wojciechowski, 2837 Fulton St., Brooklyn 7, N. Y.

SELL OR TRADE — For old coins — Radion portable battery operated VHF-UHF field strength meter, 1. n., \$45; Blonder-Tongue CA-1 commercial type TV booster, 1. n., \$25; Dumont 175A 5" scope, \$60. Anthony Kray, Putney, Vt.

FOR SALE — Rider's Radio diagram books nos. 4, 10, 11, 12, 13, for \$20 fob. Milton Lewis, 80 Elizabeth St., River Edge, N. J.

FOR SALE — Knight tape recorder, good cond., recent overhaul, similar to Wilcox 4F10, good cabinet and microphone, \$50 or best offer; multi-station inter-com., \$18. Lawrence Benjamin, Box 49, Hutchinson, Minn.

WANTED — RCA Pict-O-Guides 1, 2, 3. Royce Heintz, 3500 Woodmoor Rd., Baltimore 7, Md.

FOR SALE — Eico scope, tube checker, 6 v battery eliminator, FM and TV sig. gen., Precision E-200 sig. gen., Sprague in-circuit condenser checker, transvision CRT checker, 50 Sam's Fotofact folders. Make offer. Joseph L. Clundt, 75-42 67 Rd., Middle Village 79, N. Y.

FOR SALE — Perfect 5" picture tubes, similar to 5AXP4, with upright chassis, \$4 each postpaid. Sal Laura, 2122-West 10th St., Brooklyn, N. Y.

FOR SALE — UHF external converters in working cond. Cabinets ok, \$12.50 each. M. Boland, 1609 Alton Rd., Miami Beach, Fla.

FOR SALE — RDZ rcvr., perfect 10-channel xtal controlled 200-400 Mc 115VAC 60 cy, built by National, \$100; GE 2 amp mercury vapor tubes 16X897, \$2; CRC-38268 photo-electric tubes, \$2. G. Victor Wintriss, 620 Lake Dr., Princeton, N. J.

WANTED — Christy Electrical Appliance service course, late edition, good cond., reasonably priced. Luciano's Radio-TV Service, 516 S. First St., Fulton, N. Y.

SELL OR SWAP — Excellent Precision E-200-C sig. gen., complete with cable and book. Best cash offer or 16 mm sound projector. John H. Carnell, 492 Montrose Ave., Elmhurst, Ill.

FOR SALE — Complete 2 meter station: HB 65 watt transmitter, PTT microphone, SX 28 all-band rcvr. with Q multiplier, Techcraft converter with power supply, desk top pair, complete \$190. George S. Low, 92 Maple St., Dobbs Ferry, N. Y.

SWAP — Dynadmotor (600 v at 300 Ma.); Hallicrafters S53-A communications rcvr.; Heath LP1 linearity gen. Want Norelco projection units, scope, sweep gen., 1956 Plymouth radio or what have you? Bernard Novak, 1001 South First St., Dundee, Ill.

FOR SALE — RCA 1 kw mod trans, \$17; Millen 500 w final with coils, unused \$85; Neon signs with trans. Dumont TV and Frigidaire Appliances, \$25 each. Jack's Radio & TV Service, 111 W. Hoffman Ave., Lindenhurst, L. I., N. Y.

FOR SALE — Hammarlund HQ 129-X rcvr., in fine shape, with Hallicrafter speaker, extra filter condenser, other extras, \$115. M. Schere, 208 East 58 St., Brooklyn 3, N. Y.

FOR SALE — Complete CIRE master course with advanced TV training course leading to FCC 1st class commercial operator license. All in A-1 cond., \$125. Shipped fob. Bart B. Bonney, 1030 Chestnut Hill Dr., Easton, Pa.

FOR SALE — Meissner 150-B xmitter, 250 w input phone or CW, continuous coverage 1.5 to 12.5 Mc., factory exciter coils for 14 Mc., no changes. Complete with tubes, power cables, major spare parts, manual, \$225. R. B. Parker, 38 Ayer Lane, Harwichport, Mass.

WANTED — Cash or swap for tube socket adapter kit MX-949/U for use with US Signal Corps dynamic mutual conductance tube tester I-177B. L. Dean Powell, Ocean City Rd., Salisbury, Md.

FOR SALE — Perfect Raytheon Marine radio telephone Ray-12 complete with xtals and antenna, \$250. Want Leech-Neville alternator with regulator and rectifier 6-12 or 32 volts. Edward C. Hogge, Bena, Va.

FOR SALE — About 2000 wireless, radio, and electronic magazines, 1916-1920, 80c each, 1921-1930, 40c each, 1931-1940, 20c each, 1941-1950, 10c each. Send for list of titles. John Landa, Clayton 2, Ga.

WANTED — RCA TV Servicing course no. 2. M. E. Stack, 7840 Farrogut Ave., Chicago 31, Ill.

FOR SALE — RCA 158 5" scope, \$40; Eico: 425 5" scope, \$45, 360 sweep gen., \$35, 320 sig. gen., \$20; 214 VTMV 7", \$40, 625 tube tester, \$35, 950 RC bridge, \$20. All like new, fob. H. Weber, Sparta, Ill.

SELL — Perfect Sel-Rex selenium rectifier DC power supply, 115 VAC, 1 phase input, 0-18 v, 10 amp output cont. duty, \$100; DC motor gen. unit 110/220 v 1 phase input 115 v 6 amp DC output, wt. 225 lbs., \$50. Jack Ramsay, 1910 Hamilton St., Allentown, Pa.

WANTED — Test equipment constructed after 1945. Swap electric power tools, radios, etc. Olsen Radio, West Main St., Kingsville, Ohio.

TRADE — Stereo German camera with case, 3.5 lens, for grid dip meter or sweep gen. Stanley Wellenc, 256 12th Ave., North Tonawanda, N. Y.

FOR SALE — Webster wire recorder, Bell tape recorder, high voltage power supply 1800 v at 750 Ma., 3 Eimac 4-125A tubes, and National MB-150 tank coil. Dick Percilick, 26 Wilcox St., Dumont, N. J.

FOR SALE — Telrex 20m 3el Super-Mini beam, 1. n., \$65; Eldico TR-75 TV transmitter, \$35; CD TR-2 rotator, \$15; cath. mod., \$6; QST Mighty Mo mobile transmitter, \$10; 110V DK coax relay, \$6; Johnson lo pass filter, \$8. D. P. Friedley, 41 Audubon Rd., Wellesley, Mass.

FOR SALE — Closing down station consisting of Hammarlund HQ-150 rcvr., Harvey-Wells T-90 xmitter, and two-element 20 meter shortbeam. Want local contacts. Don Petermann, 81 Bedford Rd., Dumont, N. J.

COLLECTOR'S ITEM — Atwater Kent 10 battery set "breadboard" model, factory inspection label printed in 1924, very good cond., best offer over \$100. Robert F. Sjodin, 165-C Kealahilani Ave., Honolulu, Hawaii.

FOR SALE — Heath V-6 vac tube volt-meter, Perfect cond., \$20. R. S. Krebs, 1739 E. Susquehanna St., Allentown, Pa.

FOR SALE — 1958 edition Amateur's Radio Handbook, \$2.50 postpaid. Want 1955 Ford radio. Top Refrigeration, 7888 NE 1st Ave., Miami, Fla.

SELL OR TRADE — 500 w xmitter, VFO/exciter, HQ140-X rcvr./speaker, sig. slicer, D-104 mic., Precision VOM, etc. Best offer or typewriter, camera equip., accordion or? Frank A. Russo, 176 New York Ave., Newark 5, N. J.

TRADE — Perfect NRI Radio & TV course for up to date Coyne TV course. Fred Yaunk, 3108 Ave. H, Fort Madison, Iowa.

FOR SALE — Bandmaster Z-match coupler, \$60; Eico 5" scope, \$25; balun coils, \$5; vibrapack 12 to 150, \$6; two unit intercom, \$10; dynamotor 41S1 12 to 400/800, \$15. Phil Snyder, 133 Pickwick Lane, Babylon, N. Y.

SELL OR SWAP — Precision 920 tube and set tester, \$40; McMurdo-Silver 909 sweep gen.; EMC multi-meter 20,000 ohms, \$20; Eico 7" scope, \$65, and 221 VTMV, \$25, all perfect. Want tape recorder or photo equipment. Control TV, 123 Ave U, Brooklyn, N. Y.

SELL OR TRADE — 1½" telephoto lens F1.9 Elitar in focusing mount, fits B & H 8mm camera. Want FM tuner. R. Erbeck, 288 So. Prospect Ave., Bergenfield, N. J.

FOR SALE — Superior TV 30 sig. gen., 18 Mc to 230 Mc. Operating instructions, shielded output cable, schematic, \$12. Delivered anywhere in the U. S. Thos. M. Jones, Corunna, Mich.

WANTED — Solo-Vox, will trade radio gear or cash. Salzwedel, 810 Second St., LaPorte, Ind.

FOR SALE — Heath EA2 12 w bookshelf amplifier, perfect cond., \$25. John A. Kimm, 934 Judson St., Evansville 13, Ind.

FOR SALE — Pre-recorded tapes; 4 different stereo-stacked 1200 ft. musical tapes, @ 7½ IPS (½ hour) on new name brand 7" dia. tape, \$9.95; same, stereo-staggered, \$7.95; same, but monaural, \$6.50, all postpaid. R. Clackner, 2029 Bradley, Chicago 18, Ill.

FOR SALE — Several WE 16mfd 1000 v cond., \$1 each; dynamotors with outputs from 200 v to 1100 v; 1. n. 3 tube pocket radios, \$8 each and 4 tube portable, \$10.50. Mini-tronics, 1983 Via Del Rio, Corona, Calif.

FOR SALE — Transformers and chokes including ACRO-300, tubes including KT-66's, Lear LTRA-6 aircraft transceiver, Fisher 80 AZ power amplifier, 16 mm sound movie films. R. Bond, Box 315W, Rt. 7, Dallas, Texas.

FOR SALE — DuMont type 304-A cathode ray scope, \$200. Donco, 3023 Radcliffe Ave., Bronx 69, N. Y.

FOR SALE — Eico 360 sw gen., new condition, \$25. I. Bremer, Webster, Wis.

SELL OR TRADE — Fish breeding course and NRI VTVM, both in new cond. Want wide range grid dip meter, cash, or what have you? Edward H. Svoboda, 2117 Euclid Ave., Lincoln 2, Neb.

SELL OR SWAP — Complete Heath TS-4A TV alignment gen., xtal, leads, manual, \$35 or equivalent in FM tuner, recording tape, etc. Also Timex disc recorder, poor cond., \$10. Ira Glickstein, 21 Brighton 5th Lane, Brooklyn 35, N. Y.

FOR SALE — Deforest Training, Inc., 100 lesson course on Radio and Television. Best offer plus shipping charges. John Hrinda, 1379 Stewart St., Northampton, Pa.

SELL OR TRADE — MRT-1E FM xceiver, 152.27 Mc with AC power supply and remote control, all or separate. Want Heath A-9 or similar amplifier, fob. Emil Kalar, Box 221, So. Int'l. Falls, Minn.

FOR SALE — Sig. gen., sig. tracer, VOMA, tube tester, 100 perfect TV tubes, miscellaneous parts and tools, 13 Sam's Photofacts. Write for details. F. J. Wood, Box 75, Jeffersonville, N. Y.

WANTED — Scott speaker for 33 tube pre-World War II Philharmonic FM-all wave AM radio. Must be in top cond. Sell GE VR 1 33 rpm diamond stylus cartridge and 100 monoaural classical LP's, \$2 each. L. Karger, 55 Manor Dr., Apt 6F, Newark 6, N. J.

FOR SALE — Hallicrafters S-39 AC DC portable, slight repair needed, \$15; unused Johnson SWR bridge, \$5, Sonar low pass filter, \$7 and Vibroplex semi-automatic key, \$12; EMC tube checker, excellent, \$20. Jerome Levy, 2950 Bronx Park East, Apt 3B, Bronx 67, N. Y.

FOR SALE — Like new Magnacord S36-BX tape recorder with case and 10 1/2" reel adaptors, \$300; Supreme tube tester, \$20; Hallicrafter S-38 rcvr., \$20; SCR-522 accessories unaltered, \$20. Douglas Greenwood, 62 Summit Ave., Athol, Mass.

SELL — Radio service parts: tubes, multimeter, manuals, etc. Sacrifice at less than half my cost. Send for list. Sam J. Tomasell, 30 Longcroft Rd., Rochester 9, N. Y.

SELL OR EXCHANGE — American photocopy machine (\$335 value) for test equip., tubes, recorders, radios, TV set, tools, or what have you? E. G. Bartlett, Atlanta, Mo.

WANTED — Millen or Measurements grid dip meter; Vomag or similar sweep gen. or VTVM; 5BP1/1802-P1 CRT; Meissner analyst. Have Superior channel analyzer; Eico 360 sweep gen.; RCA 160-B 5" scope; car radios, etc., to trade. McKinley's Radio & TV Service, Zebulon, Ga.

WANTED — 100 w modulation transformer, universal or 6,000 to 9,000 ohm secondary. Also need 10, 15, 20 meter beam and pole. Have BC 645 and Johnson Adventurer to trade. J. E. Lockman, 2145 Brookview Dr. N.W., Atlanta 18, Ga.

FOR SALE — GE 10" table model TV, \$15; Rathen Bellmont 10" TV, AC-DC, \$20; old tubes, 15c each. J. Kramer, 229 E 7th St., New York City, N. Y.

SELL OR TRADE — Complete QST vols. from 1942 to 1955, TZ40, 866's, Heath GDO, Eico multimeter, IRE Proceedings from June 1954 to May 1958. Harold Greenfield, 9501 N. Lorel Ave., Skokie, Ill.

WANTED — Sylvania marker gen., type 501. Davids Radio & TV, 223 Linn St., Crawford, Neb.

WANTED — To buy or borrow operations manual or schematic for 'Solar' capacitor analyzer type CE-2U. N. Morse, 28 Casey Rd., Campbell, Calif.

WANTED — Good comm. rcvr. and semi automatic bug. Will buy or trade Jackson tube checker, 10" Philco TV set and RAO rcvr. All in good cond. Al Potter, 2 Buttonwood Dr., Sayreville-N. J.

FOR SALE — Precision tube tester, Electronic series 920, measures AC and DC v., DC current, resistance, and decibels, tests dry batteries and paper condensers. Make offer. R. B. Johnson, 3922 W. 108 St., Inglewood, Calif.

FOR SALE — Simpson 303 VTVM with HF probe, \$40; Heath amplifier W5-N WA-P2, \$50. Both like new. Express. A. P. Smith, 113 E. Central, Lombard, Ill.

WANTED — Marker gen. and adder, service manuals, Photofacts, Teleads, Supreme radio and TV diagrams. Give complete description. Robert Wright, 1830 NW 122nd St., Miami, Fla.

FOR SALE — 5" scope tube JAN-CNY-5CP1, \$4 plus postage; 24 relays 24 v 60 cycle coils, assorted single to 5 contacts, 20c each plus 20c per order postage. Vernon Schmidt, Park View, Harrisonburg, Va.

WANTED — 6D6, 7B7, 78 tubes, etc. Will exchange for others. Send for list. Sell RMS booster, \$5; Precision 920 set and tube tester, \$35; Crescent portable 3-speed record player complete with amp, \$30. Andrews, 740 Maple, Bethlehem, Pa.

FOR SALE — DX-100 Heathkit xmitter, fully assembled, wiring checked. Best offer over \$150. F. Van Newkirk, 654 Freeman St., Orange, N. J.

FOR SALE — Heath scope OM-1/demod., low cap. and direct probes, \$25; Eico bar gen. 352, \$10; Universal power pack 2 amps variable 12 VDC, \$7. All like new. Witmer, 13 606 948, Hq. USATCA, Ft. Knox, Ky.

WANTED — GE radio E-155 Colorama tuning in working order and Colorama saturable reactor for same model. Mikell's Electric Supply, 21 Irving St., Montclair, N. J.

WANTED — TV rcvr, chassis only, Kinney or rec. tubes not reqd.; Hallcrafters 600 to 604, good cond. Paul Granick, 52 No. Hancock St., Wilkes Barre, Pa.

FOR SALE — Telefunken CM-51 recording microphone, used as demonstrator only, \$290. James Neuville, 5204 NE Prescott St., Portland, Ore.

WANTED — Home study course in electric refrigeration. Michael Hoblak, Jr., R 1, Noxen, Pa.

SELL OR TRADE — Jerrold ADO-3 Mul-TV antenna system consisting of 2 four channel amplifiers with strips and 8 distribution units for Webcor tape recorder EP 2791-1. K. Eimer, 204 Elmwood Ave., Brooklyn 30, N. Y.

FOR SALE — BC224E rcvr. converted, 110 VAC, S meter, 200-500 Kc, 1.5-18 Mc, xtal, BFO, \$65. Leo Packer, 314 Grover Ave. No., Massapequa, L. I., N. Y.

FOR SALE — Kelly ribbon tweeter, \$35; 12 w Electrovoice woofer, \$35; Electrovoice T-35 tweeter and crossover network, \$25; Ortofon C diam. stylus pick-up and prof. arm, \$50; Leak diam. pick-up and arm, \$35. Prices fob. Carl Hovland, 151 Hartford Tnpk., Hamden, Conn.

FOR SALE — HQ-100 rcvr., new cond.; VM 710 Tape-O-Matic tape recorder, excellent cond.; 6 v 40 amp DC gen. and regulator. Make offer. Cliff, Box 113, Bay Village, Ohio.

WANTED — Original instruction manual not mimeographed copy for RME-69 rcvr. R. A. Hanlon, 960 Shauna Lane, Palo Alto, Calif.

FOR SALE — National NC-98, 550 Kcs to 40 Mcs range, xtal filter, S meter, calibrated amateur band spread, A-1 cond. in original carton, and instruction manuals. Best offer. C. Wagel, Box 521, Lancaster, Pa.

FOR SALE — Regency UHF converter RC53 9v-450v dynamotor, also tubes back to 1930, new and used. Want a 30-50 Mc rcvr. W. E. Fuller, R 1, Dimondale, Mich.

FOR SALE — RCA 167B slightly used test oscillator, \$10. T. Rosenfeld, 4652 Camac St., Philadelphia 40, Pa.

SELL OR TRADE — Weston capacity meter model 664, good cond. Clyde V. Hughes, 609 45 St., Brooklyn 20, N. Y.

TRADE — Course in locksmithing for another course or books on Electronics. N. B. Bowerman, 1520 Plank Rd., Jeffersonville, Ind.

FOR SALE — Superior TC-55 tube tester perfect cond. with case, \$18; Knight sweep gen. wired in perfect working cond., with 4.5 xtal and leads, \$40. Both plus postage. W. A. Koehler, 131 Stratford Dr., Houghton Lake 12, Mich.

WANTED — Tubes: 810, 813, 829B, 833A, 866A, 4-250A, 4-400A, 4E27; ARC-12, ARN-14C, and -30, BC-610 plate and modulation transformer; UHF gear; gov't tech. manuals. Bill Slep, Box 178, Ellenton, Fla.

WANTED — WE 756A speaker in excellent cond. L. A. Webb, 825 Parke's Run Lane, Villanova, Pa.

FOR SALE — Riders 6 thru 14, \$5 per vol; Sams 50 thru 230, \$7.50 per vol; TVG2 Jackson gen., \$90; Eico 425 scope, \$35; Solar exometer, \$45; Mallory 6-12 v converter, \$20. All in excellent cond. Jho Elrod, Box 1121, Ft. Worth, Texas.

FOR SALE — Minifone 2-hour pocket wire recorder, accessories included. Hardly used, \$225. Frank Wirrer, 754 24th St., Santa Monica, Calif.

FOR SALE — Motorola FMTR-80D M-1a 25 to 50 Mc mobile xmitter with Sensicon rcvr. in single case with all tubes and dynamotor, \$70. 1-208 FM sig. gen. 1.9 to 4.5 Mc and 19 to 45 Mc. C. T. Yeago, 1109 Pennsylvania Ave., Steubenville, Ohio.

WANTED — At reasonable price and local, old sets in the 1920's, 01A or 99 tube type battery sets. State price and set description. H. Knapp, 7307 W. 85th St., Oaklawn, Ill.

FOR SALE — BC221 freq. meter with extra case, regulated power supply, \$85; Galvanic selenium rectifier tester, \$18; Precision sig. gen. E-200C, \$45; Clough-Brengle Navy type CLB 600 capacity resistance bridge, \$50. Cleo Zaiella, 937 Centre St., Brockton 11, Mass.

WANTED — Tube testers, sig. gen., amplifiers, and other test equipment. Prefer within 50 mile of Reading, Pa. Temple Teleservis, Euclid and Lamont Sts., Temple, Pa.

FOR SALE — Rider's Radio Trouble Shooters manuals, 2 thru 19, \$55 plus freight. Art Stattelmann, 323 So. Russell Ave., Ames, Iowa.

SELL OR SWAP — 50 w McIntosh amp, 4 channel Kinevox portable commercial mixer, UTC 3A equalizer, misc. recording and hi-fi parts. Bill L. Godden, 8718 E. 77th Terr., Kansas City 33, Mo.

FOR SALE — Ampex Stereophonic tape recorder system complete, used less than 25 hours, \$650.; Marantz audio consolette, 1. n., \$100; unused Capacitance burgular and fire alarm, \$80 off cost. Philip P. LiCalzi, Box 66, Greenwich, N. J.

FOR SALE — German made Precision portable: output meter 5 ranges, \$20, and volt ammeter, volts .03 to 300 VDC, amps .003 to 15 amps, \$15 and German Lorenz broadcasting carbon microphone, \$5. All postpaid. Albert Hart, 207 N. Raymond St., Griffith, Ind.

FOR SALE — U. S. 19 Mark II xmitter, rcvr., and power supply with manual, 2000-8000 Kcs and 235 Mc. Highest offer, never used. Jack Haken, 99 Wall St., New York 5, N. Y.

FOR SALE — Perfect Paco C-20 resistance-capacitor tester and instructions, for cash, \$23. Louis Scheinfeldt, 5305 Diamond St., Philadelphia 31, Pa.

FOR SALE — Vol. 1 and 2 Servicing TV Receivers by Sylvania and Pict-O-Guide vol. 2, 1. n., \$5; Radio Troubleshooter's Handbook by Ghirardi, \$4; Rider Radio manuals 3 to 16, \$60. Al Crispo, 85-02 133rd Ave., Ozone Park 17, N. Y.

FOR SALE — Hammurlund HQ110 without clock in original carton, perfect cond., \$175. W. L. Sillman, 193 Moffat St., Brooklyn 7, N. Y.

WANTED — Any type hot air engines and books, catalogs, etc., about same for radio equipment or cash. Bob Weaver, Box 1574, Santa Barbara, Calif.

FOR SALE — AT-1 with antenna trimer, \$20; S-40B with built-in QF-1, \$55. Joe Taschetta, 207 N. Morgan, Wheaton, Ill.

FOR SALE — LX2 microvolt sig. gen., 8-330 mg calibrated attenuator .5UVTO MV output meter and % mod. meter, 10:1 attenuators and terminal unit, cables, and manual and extra range coilform. Cost over \$800. New cond. First \$125 takes it. Ralph Serrano, 34 Beech Ave., Aldan, Dec. Co., Pa.

SELL OR SWAP — Jackson push button 648 tube tester, Motorola auto radio, 12 assorted Photofact sets. Need auto radio for 52 Chevrolet, hi-fi equipment (table, amp., speaker), stereo slide projector. A. Perlmutter, 11 West St., Sharon, Mass.

SELL OR SWAP — Hickok 5" scope model 195 Navy surplus for communications rcvr., sweep gen., or \$70. Meyer Kaplan, 131-71 223 St., Laurelton, L. I., N. Y.

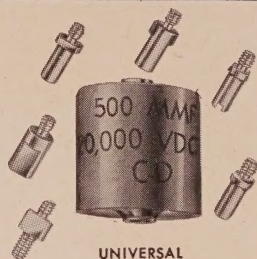
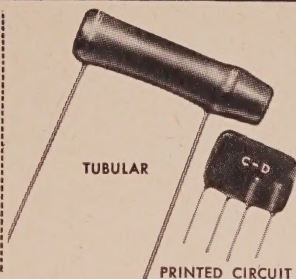
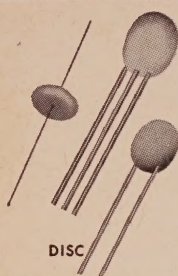
FOR SALE — Riders Radio manuals 1 to 22, Sams Photofacts, many other books, excellent cond., \$100 or best offer; Supreme multi-tester, \$25. P. H. DeLaney, 632 Haddon Ave., Collingswood, N. J.

WANTED — Electro D-612T power supply; Tektronix 515 scope. Describe fully and quote price including shipping. A. Sydnor, 304 Lakeview Dr., Ridley Park, Pa.

WANTED — 6 volt to 110 VAC inverter about 100 watts. Cash or swap radio or s.f. magazines. V. Johannes, 1541 Metropolitan Ave., Bronx 62, N. Y.

WANTED — Rider Tech Pack 32 or Service manual for Freed-Eisman Ch. 1620. H. A. Johnson, 8218 10 Ave., Brooklyn 28, N. Y.

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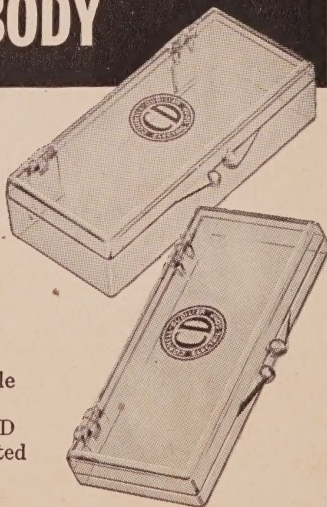


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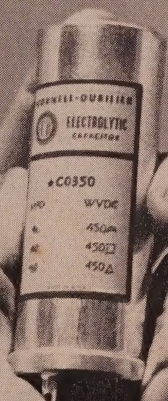


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